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## CONTRIBUTION TO THE VASCULAR FLORA OF PIETRAPORCIANA NATURE RESERVE (SOUTHERN TUSCANY, ITALY)

**Abstract** - Contribution to the vascular flora of Pietraporciana Nature Reserve (southern Tuscany, Italy). With the aim of improving the available botanical knowledge of Southern Tuscany and of the Pietraporciana Reserve, located in the south-eastern part of Siena province, the Tuscan Section of the Società Botanica Italiana (S.B.I.) organized a field excursion to prepare a contribution to the vascular flora. In this report we provide two separate floristic inventories of both the results of recent field survey data and a literature search. The lists include respectively 372 and 123 specific and subspecific taxa. Species of interest for the region include: *Crataegus ×media* (first record for Tuscany), *Teucrium siculum* subsp. *siculum* (very rare in Southern Tuscany), *Avena sterilis* subsp. *ludoviciana* (second record of this subspecies for Tuscany), and *Centaurea arrigonii* (first record for Southern Tuscany). Eleven Italian endemic taxa were recorded at the Reserve. Thirtysix are the species of conservation interest, 24 of which included in Tuscany Regional Law 56/2000. Only two exotic species (*Artemisia verlotiorum* and *Robinia pseudoacacia*) were recorded as self-introduced at the reserve. This study highlights peculiarities of the flora present including species typical of xerophilous grasslands and more orophilous species.

**Key words** - Flora, Central Italy, Southern Tuscany, protected area, conservation, rare species

**Riassunto** - Contributo alla flora vascolare della Riserva Naturale di Pietraporciana (Toscana meridionale, Italia). Allo scopo di incrementare le conoscenze floristiche per la Toscana meridionale e per la Riserva Naturale di Pietraporciana, situata nella parte meridionale orientale della provincia di Siena, la Sezione Toscana della Società Botanica Italiana (S.B.I.), ha organizzato un'escursione al fine di preparare un contributo alla flora vascolare presente. In questo lavoro si riportano due distinte liste floristiche che comprendono dati di nuova acquisizione e di letteratura. Le liste riportano rispettivamente 372 e 123 specie e sottospecie. Specie di interesse floristico per la regione sono: *Crataegus ×media* (primo ritrovamento in Toscana), *Teucrium siculum* subsp. *siculum* (molto raro in Toscana meridionale), *Avena sterilis* subsp. *ludoviciana* (secondo ritrovamento in Toscana) e *Centaurea arrigonii* (primo ritrovamento in Toscana meridionale). Undici sono le specie endemiche mentre sono 36 le specie di interesse conservazionistico nella Riserva, di cui 24 sono incluse nella Legge Regionale 56/2000. Se si escludono le specie introdotte per rimboschimenti e per fini ornamentali, sono 2 le specie esotiche (*Artemisia verlotiorum* e *Robinia pseudoacacia*). Questo studio sottolinea inoltre le peculiarità della flora locale che include specie xerofile di prateria e specie più orofile.

**Parole chiave** - Flora, Italia centrale, Toscana meridionale, area protetta, conservazione, specie rare

### INTRODUCTION

Southern Tuscany is an area of scarce human activity with diverse environmental conditions ranging from plain to mountainous landscapes and extensive intermediate hill ranges. According to Angiolini *et al.* (2005), most of the floristic information of Southern Tuscany is limited to “general floristic knowledge”; however, the knowledge on the flora of the region is gradually improving due to recent contributions (Frignani *et al.*, 2007; 2008; Lastrucci *et al.*, 2007; Selvi, 2010; Landi *et al.*, 2009; 2012; 2013-2014; Angiolini *et al.*, 2013; Da Vela *et al.*, 2014; Gabellini *et al.*, 2015; Bedini *et al.*, 2016; Bonari *et al.*, 2016b). Although Pietraporciana Nature Reserve, established for conservation of relict beech forest, falls within an area previously described as a “rather well known area” (Angiolini *et al.*, 2005), including Val d’Orcia and surroundings hills of Monte Amiata, no complete floristic list is available. For this reason, the annual excursion of the Tuscan Section of Società Botanica Italiana (S.B.I.) was held in this area, on June 12th 2015. In this paper, therefore, we provide a contribution to the knowledge of vascular Flora of Pietraporciana Nature Reserve, and of Southern Tuscany. Furthermore, we compliment our findings with a literature research of all taxa previously recorded and published for this area. Thus, two floristic lists are reported: the survey findings and the literature search data. Conservation value of the flora of Pietraporciana Reserve is also discussed.

### STUDY AREA

Pietraporciana Provincial Nature Reserve was established by resolution of the Provincial Council, in accor-

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dance with L.R. No. 49/1996, becoming part of the Siena Nature Reserve network. The Reserve is located in southeastern Siena province, just over 10 km from the border with Umbria, and covers 336 hectares. The land consists of part of a ridge that runs from Chianciano Terme to Sarteano to Monte Cetona in the south, separating Val d'Orcia (West) from Val di Chiana (East) (Fig. 1). The Reserve includes the summit and part of the north face of Pietraporciana (847 m). The lowest point of the Reserve (429 m) is located adjacent to the Fosso Ginestra ditch, which flows into the Torrente Astrone stream, at the northern limit of the Reserve. Aside from the ditch Fosso Ginestra there are also nu-

ded with limestone, calcareous-marl and calcarenitic, sandstones and siliceous shales. Vertical cliffs formed by poorly coherent limestone sometimes occur along hilltops. Cliffs present on the Reserve are up to 200 m in length and 20-30 m height (Lazzarotto, 1993; De Dominicis *et al.*, 1996).

## CLIMATE

The Reserve falls into the temperate division according to the ecoregions classification by Blasi *et al.* (2014). The area in which the Reserve lies is at a transition between the warm and dry region of Val di Chiana, and the increasingly wet and humid region of nearby Monte Amiata. The northern portion of Reserve, next to the Torrente Astrone stream, has a sub-humid climate, while the remainder of the Reserve is of a wet climatic type. The average annual precipitation (data obtained from the nearby Castiglioncello del Trinoro station) is 978 mm, while average annual temperature is 11.5°C. In this area, water deficit periods do not occur (Barazuoli *et al.*, 1993; De Dominicis *et al.*, 1996).

## VEGETATION TYPES

The most interesting vegetation aspect of Pietraporciana Nature Reserve is represented by the heterotopic beech forest covering approximately 6 hectares (Mariotti, 1990) that is located on the steep slope of Poggio di Pietraporciana, between 720 and 800 m a.s.l. (Frassinetti & Bottacci, 1997). This forest constitutes a well-preserved "relict", i.e. the remains of larger beech forests which historically covered the region over a period of several thousand years. This habitat type is cited among the notable biotopes of importance classified as worthy of preservation in Italy (Masi, 1974; Sabbatini *et al.*, 2011). It is a eutrophic beech climax forest, the microclimate of which is ensured by the northern aspect (Frassinetti & Bottacci, 1997). Furthermore, its extraordinary natural value is also represented by huge individual specimens of *Fagus sylvatica*. Below 600 m, in conditions of lower humidity, *Quercus cerris* forest is the dominant vegetation type. These formations can be classified, in relation to altitude and substrate, as follows: i) mesic forest of *Q. cerris*, with *Carpinus betulus*, *Acer opalus* subsp. *obtusatum*, *Ostrya carpinifolia*; ii) acidophilous mesic forest of *Q. cerris*, characterized by *Carpinus betulus*, *Sorbus torminalis*, *Tilia cordata*, *Fagus sylvatica*, *Castanea sativa* and *Quercus petraea* subsp. *petraea* occurring in different percentages; iii) thermophilous forest at lower altitudes with *Q. cerris* combined with *Quercus pubescens* subsp. *pubescens*, *Ostrya carpinifolia*, *Acer campestre*, *A. monspessulanum* subsp. *monspessulanum*. Flatter areas of the southwest-

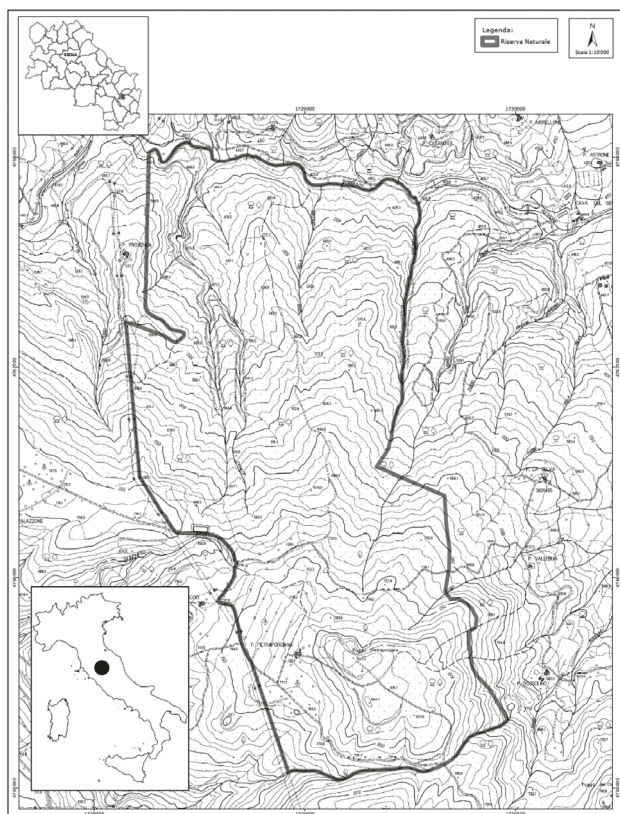


Fig. 1. Reserve location in Italy (bottom left corner) in relation to Siena province (top left corner). The limits of the study area are shown in black (the boundary of Pietraporciana Nature Reserve, Sarteano, Siena).

merous ditches including Fosso Cavallo. The only body of water within Reserve is an artificial lake called Lago dell'Omo Morto (De Dominicis *et al.*, 1996).

## GEOMORPHOLOGY AND GEOLOGY

From a geomorphological point of view, the area is hilly, with occasional small and poorly incised streams. From a geological perspective, the hills are mainly composed by Pliocene marine formations, lithologically expressed in clays and silty marl interbed-



ern part of the Reserve at the limit of beech forest, comprising abandoned agricultural areas, have been partially reforested with a number of conifer species that provide an intermittent canopy in meadow and shrub habitat. On the top of the hill a strip of stony arid grassland, with a biocalcarene substrate, supports *Bromopsis erecta*, accompanied by numerous xerophilous species such as *Festuca inops*, *Teucrium capitatum* subsp. *capitatum*, *Helianthemum apenninum* subsp. *apenninum*, *Coronilla minima* subsp. *minima*, *Convolvulus cantabrica*, *Pilosella officinarum*, etc. (De Dominicis *et al.*, 1996; Frignani & Geri, 2007).

## MATERIALS AND METHODS

The first mention of floristic data of Pietraporciana area goes back to Negri (1930) although he merely cited the Reserve for hosting *Fagus sylvatica* at low altitude. Thirtyfour years later, Masi (1974) mentioned this forest as a biotope of important naturalistic interest, subsequently re-cited by Mariotti (1990). Not long after, Frassinetti (1996) and Frassinetti & Bottacci (1997) investigated structural and floristic aspects of the beech forest, providing a short floristic list limited to the beech forest habitat present at the site. In the same year, De Dominicis *et al.* (1996) and later Frignani & Geri (2007), produced management proposals including a list of species of conservation interest and vegetation types within the Reserve. Afterwards, Salerni *et al.* (2007) published data obtained from phytosociological relevés. In 2011, two papers provided a valuable contribution by relevés data (Sabbatini *et al.*, 2011; Salerni *et al.*, 2011); in the same year, Frignani (2011) contribute with a list of orchids occurring in this Reserve, within a larger work on orchids of the province of Siena. To produce the floristic review of the Reserve, a literature search was undertaken to prepare a bibliographic floristic list, and several field surveys were undertaken between April 2015 and October 2015 (including the annual excursion of Tuscany Section of the Società Botanica Italiana (S.B.I.), held on 12<sup>th</sup> June of 2015) in order to record as comprehensively as possible the distribution, diversity and variability of the local flora. During the surveys, vascular plants were recorded and/or collected. Voucher specimens are preserved in SIENA, UTV and FI (acronyms follow Thiers, 2016). For species identification, we mainly referred to Pignatti (1982) and Tutin *et al.* (1964-1980). In critical cases we also considered monographs, books and specific papers (Fiori, 1923-1929; Rocha Alfonso, 1980; Castroviejo *et al.*, 1984-2005; Christensen, 1992; Tutin *et al.*, 1993; Greuter, 2003; Aeschmann *et al.*, 2004; Ciccarelli & Garbari, 2004; Marchetti, 2004; Garbari *et al.*, 2008; Frignani, 2011; Hardion *et al.*, 2012; Romolini & Souche, 2012; Harpke *et al.*, 2015; Mayer, 2015; Bonari

*et al.*, 2016a; Guarino *et al.*, 2016 – onwards). Scientific names are attributed according to Conti *et al.* (2005; 2007) or to more recent works. The circumscription and systematic order of families follows Peruzzi (2010). Genera and species are arranged, within each family, in alphabetical order. Life forms and chorological types were assigned according to Pignatti (1982). For distribution of Italian endemic taxa, we referred to Peruzzi *et al.* (2014, onwards). Finally, Conti *et al.* (1997), Scoppola & Spampinato (2005), Rossi *et al.* (2013), Annexes of Regional Law 56/2000 and plant list of Re.Na. To (Sposimo & Castelli, 2005), were checked to verify conservation status for each taxon. To conclude, following symbols precede each species in the two floristic lists.

Floristic list obtained from the field investigations:

- = Species recorded during the surveys. Voucher specimens were collected and later identified using herbarium specimens. Data from literature were also reported for each taxon if present.
- = Species recorded during the S.B.I. excursion with no voucher specimen; identification directly confirmed in the field due to experts evaluation.

Bibliographic floristic list:

- ◆ = Species reported in literature.
- ? = Species reported in literature but questions surround original identification.

## FLORISTIC LIST

### EQUISETIDAE

#### Equisetaceae

- *Equisetum telmateia* Ehrh. – G rhiz – Circumbor.

### POLYPODIIDAE

#### Dennstaedtiaceae

- *Pteridium aquilinum* (L.) Kuhn subsp. *aquilinum* – G rhiz – Cosmopol. – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011

#### Aspleniaceae

- *Asplenium trichomanes* L. – H ros – Cosmopol. – SIENA
- Note: Collected plants are without rhizomes and well-developed sporangia, essential characters for a subspecific determination.

### PINIDAE

#### Cupressaceae

- *Chamaecyparis lawsoniana* (A.Murray) Parl. – P scap – Culta – SIENA
- *Cupressus sempervirens* L. – P scap – Culta – SIENA

- De Dominicis *et al.*, 1996 – Frignani & Geri, 2007
- *Juniperus communis* L. – P caesp – Circumbor. – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011

#### Pinaceae

- *Abies alba* Mill. – P scap – Culta – De Dominicis *et al.*, 1996 – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007
- *Abies cephalonica* Loudon – P scap – Culta – SIENA – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007
- *Cedrus atlantica* (Endl.) Carrière – P scap – Culta
- *Cedrus deodara* (Roxb.) G.Don – P scap – Culta
- *Pinus nigra* J.F.Arnold subsp. *nigra* – P scap – Culta – De Dominicis *et al.*, 1996 – Salerni *et al.*, 2007; 2011 as *Pinus nigra* Arnold – Frignani & Geri, 2007
- *Pinus sylvestris* L. – P scap – Culta
- *Pseudotsuga menziesii* (Mirb.) Franco – P scap – Culta – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007

#### MAGNOLIIDAE

##### Araceae

- *Arum maculatum* L. – G rhiz – Central Europe – SIENA; UTV – Frassinetti & Bottacci, 1997

##### Alismataceae

- *Alisma lanceolatum* With. – He (I rad) – Subcosmop.

##### Potamogetonaceae

- *Potamogeton natans* L. – I rad – Subcosmop.

##### Dioscoreaceae

- *Dioscorea communis* (L.) Caddick & Wilkin – G rad – Eurimedit. – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011 – Sabbatini *et al.*, 2011 as *Tamus communis* L.

##### Liliaceae

- *Lilium bulbiferum* L. subsp. *croceum* (Chaix) Jan – G bulb – Orof. S Europ. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007 – Sabbatini *et al.*, 2011

##### Orchidaceae

- *Anacamptis coriophora* (L.) R.M.Bateman, Pridgeon & M.W.Chase – G bulb – Eurimedit. – Frignani, 2011 – Salerni *et al.*, 2011
- *Anacamptis pyramidalis* (L.) Rich. – G bulb – Eurimedit. – Salerni *et al.*, 2007; 2011
- *Cephalanthera damasonium* (Mill.) Druce – G rhiz – Eur Medit. – Frassinetti & Bottacci, 1997 – Frignani, 2011 – Sabbatini *et al.*, 2011 – Salerni *et al.*, 2011
- *Epipactis helleborine* (L.) Crantz – G rhiz – Paleotemp. – Salerni *et al.*, 2007; 2011
- *Epipactis microphylla* (Ehrh.) Sw. – G rhiz – Europ. Caucas. – Sabbatini *et al.*, 2011
- *Neottia nidus-avis* (L.) Rich. – G rhiz – Eurasiat. –

- De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007 – Frignani, 2011

##### Iridaceae

- *Crocus neglectus* Peruzzi & Carta – G bulb – C-Medit.

Note: According to Harpke *et al.* (2015) the distribution of this recently described species is Northern Italy (Liguria, Tuscany, Emilia-Romagna).

##### Amaryllidaceae

- *Allium pendulinum* Ten. – G bulb – Stenomedit. Occ. – SIENA – Frassinetti & Bottacci, 1997
- *Allium ursinum* L. – G bulb – Eurasiat. Temp. – Frassinetti & Bottacci, 1997
- *Allium vineale* L. – G bulb – Eurimedit.

##### Asparagaceae

- *Anthericum liliago* L. – G bulb – Submedit. Subatl.
- *Asparagus acutifolius* L. – G rhiz – Stenomedit.
- *Asparagus tenuifolius* Lam. – G rhiz – SE-Europe and W-Asiatic (Pontic) – SIENA
- *Loncomelos narbonensis* (L.) Raf. – G bulb – Eurimedit.
- *Muscari comosum* (L.) Mill. – G bulb – Eurimedit. – Salerni *et al.*, 2011 as *Leopoldia comosa* (L.) Parl.
- *Ornithogalum etruscum* Parl. subsp. *etruscum* – G bulb – Endemic – UTV
- *Polygonatum multiflorum* (L.) All. – G rhiz – Eurasiat. – SIENA – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Sabbatini *et al.*, 2011
- *Ruscus aculeatus* L. – G rhiz – Eurimedit.
- *Scilla bifolia* L. – G bulb – Europ. Caucas. – Frassinetti & Bottacci, 1997

##### Typhaceae

- *Typha angustifolia* L. – He – Circumbor. – SIENA
- *Typha latifolia* L. – He – Cosmop.

##### Juncaceae

- *Juncus articulatus* L. – G rhiz – Circumbor. – SIENA
- *Juncus inflexus* L. – H caesp – Paleotemp. – Salerni *et al.*, 2007; 2011
- *Luzula campestris* (L.) DC. – H caesp – Europ. Caucas. – SIENA

##### Cyperaceae

- *Carex caryophylla* Latourr. – H scap – Eurasiat. – SIENA
- *Carex digitata* L. – H caesp – Eurasiat. – Frassinetti & Bottacci, 1997
- *Carex flacca* Schreb. – G rhiz – Europ. – Salerni *et al.*, 2007; 2011
- *Carex sylvatica* Huds. subsp. *sylvatica* – H caesp – Europ. W-Asiat.
- *Cyperus fuscus* L. – T caesp – Paleotemp. – SIENA
- *Schoenoplectus tabernaemontani* (C.C.Gmel.) Palla – He – Eurosib. – SIENA
- *Scirpoides holoschoenus* (L.) Soják – G rhiz – Eurimedit.



medit. – Salerni *et al.*, 2007; 2011 as *Holoschoenus australis* (L.) Rchb.

#### Poaceae

○ *Anisantha sterilis* (L.) Nevski – T scap – Eurimedit. Turan.

○ *Anthoxanthum odoratum* L. – H caesp – Eurasiat.

○ *Avena barbata* Pott ex Link – T scap – Eurimedit. Turan.

● *Avena sterilis* L. subsp. *ludoviciana* (Durieu) Gillet & Magne – T scap – Eurimedit. Turan. – SIENA

Note: The glumes 30(-33) mm long, with max 9 veins, the presence of 3 flowers, awns < 50 mm and ligules 2-3 mm long support the attribution to *Avena sterilis* L. subsp. *ludoviciana* (Durieu) Gillet & Magne (Rocha Alfonso, 1980). This is the second finding for Tuscany of this subspecies, after Arrigoni (2003).

○ *Brachypodium rupestre* (Host) Roem. & Schult. – H caesp – Subatl. – Salerni *et al.*, 2007; 2011

○ *Brachypodium sylvaticum* (Huds.) P.Beauv. subsp. *sylvaticum* – H caesp – Paleotemp. – Salerni *et al.*, 2007; 2011

● *Briza media* L. – H caesp – Eurosib. – SIENA

○ *Bromopsis erecta* (Huds.) Fourr. subsp. *erecta* – H caesp – Paleotemp. – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007 as *Bromus erectus* Huds.

○ *Bromopsis ramosa* (Huds.) Holub – H caesp – Eurasiat.

○ *Bromus hordeaceus* L. s.l. – T scap – Subcosmop.

○ *Catapodium rigidum* (L.) C.E.Hubb. subsp. *rigidum* – T scap – Eurimedit.

○ *Cynosurus cristatus* L. – H caesp – Europ. Caucas. – Salerni *et al.*, 2011

○ *Cynosurus echinatus* L. – T scap – Eurimedit.

○ *Dactylis glomerata* L. subsp. *glomerata* – H caesp – Paleotemp. – Salerni *et al.*, 2007; 2011

○ *Festuca inops* De Not. – H caesp – Subendemic – De Dominicis *et al.*, 1996 as *Festuca gr. ovina* – Frignani & Geri, 2007

○ *Gaudinia fragilis* (L.) P.Beauv. – T scap – Eurimedit.

○ *Holcus lanatus* L. – H caesp – Circumbor. – Salerni *et al.*, 2007; 2011

○ *Hordeum murinum* L. subsp. *leporinum* (Link) Arcang. – T scap – Eurimedit.

○ *Koeleria splendens* C.Presl – H caesp – Endemic – Salerni *et al.*, 2011

● *Lolium arundinaceum* (Schreb.) Darbysh. subsp. *arundinaceum* – H caesp – Paleotemp. – SIENA – Salerni *et al.*, 2007; 2011 as *Festuca arundinacea* Schreb.

○ *Lolium perenne* L. – H caesp – Circumbor.

○ *Melica uniflora* Retz. – H caesp – Paleotemp. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007 – Sabbatini *et al.*, 2011

● *Phalaris caerulea* Desf. – H caesp – Stenomedit. Macarones. – SIENA

○ *Phleum hirsutum* Honck. subsp. *ambiguum* (Ten.) Tzvelev – G rhiz – Central Europe

● *Phleum pratense* L. – H caesp – Central Europe – SIENA

● *Poa angustifolia* L. – H caesp – Cosmopol. – SIENA – Salerni *et al.*, 2007; 2011 as *Poa pratensis* L. subsp. *angustifolia* (L.) Gaudin

○ *Poa annua* L. – T caesp – Cosmopol.

○ *Triticum vagans* (Jord. & Fourr.) Greuter – T scap – Stenomedit. Turan.

#### Papaveraceae

● *Chelidonium majus* L. – H scap – Eurasiat. (Circumbor.) – SIENA – Frassinetti & Bottacci, 1997

● *Corydalis cava* (L.) Schweigg. & Körte subsp. *cava* – G bulb – Europ. Caucas. – SIENA – Frassinetti & Bottacci, 1997

○ *Papaver rhoeas* L. subsp. *rhoeas* – T scap – E-Medit. (Archeo.)

#### Ranunculaceae

○ *Anemone apennina* L. subsp. *apennina* – G rhiz – SE-Europ.

○ *Clematis vitalba* L. – P lian – Europ. Caucas. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007

● *Delphinium consolida* L. subsp. *consolida* – T scap – Eurimedit. (Archeo.) – SIENA

● *Ficaria verna* Huds. subsp. *verna* – G bulb – Eurasiat. – SIENA

○ *Helleborus foetidus* L. subsp. *foetidus* – Ch suffr – Subatl. – Frassinetti & Bottacci, 1997 – Sabbatini *et al.*, 2011

○ *Helleborus viridis* L. subsp. *bocconeii* (Ten.) Peruzzi – G rhiz – Endemic – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011 as *Helleborus bocconeii* Ten. – Frignani & Geri, 2007 – Sabbatini *et al.*, 2011

○ *Hepatica nobilis* Schreb. – G rhiz – Circumbor. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007 – Sabbatini *et al.*, 2011

● *Ranunculus garganicus* Ten. – H scap – N-Medit. – SIENA

● *Ranunculus lanuginosus* L. – H scap – Europ. Caucas. – SIENA – Frassinetti & Bottacci, 1997

○ *Ranunculus repens* L. – H rept – Paleotemp. (Subcosmop.)

○ *Thalictrum aquilegifolium* L. subsp. *aquilegifolium* – H scap – Eurosib.

#### Saxifragaceae

● *Saxifraga tridactylites* L. – T scap – Eurimedit. – SIENA

#### Crassulaceae

● *Sedum acre* L. – Ch succ – Europ. Caucas. – SIENA

● *Sedum cepaea* L. – T scap – Submedit. Subatl. – SIENA

○ *Sedum sexangulare* L. – Ch succ – Central Europe

## Fabaceae

- *Anthyllis vulneraria* L. subsp. *rubriflora* (DC.) Arcang. – H scap – Eurimedit.
- *Astragalus glycyphyllos* L. – H rept – Europ. S-Sib.
- *Coronilla minima* L. subsp. *minima* – Ch suffr – W-Medit. – UTV – De Dominicis *et al.*, 1996 – Salerni *et al.*, 2007; 2011 as *Coronilla minima* L. – Frignani & Geri, 2007
- *Coronilla scorpioides* (L.) W.D.J.Koch – T scap – Eurimedit. – Salerni *et al.*, 2007; 2011
- *Cytisophyllum sessilifolium* (L.) O. Lang – P caesp – Orofil. SW-Europ. – Salerni *et al.*, 2007; 2011 as *Cytisus sessilifolius* L.
- *Cytisus hirsutus* L. – Ch suffr – Eurosib. – SIENA
- *Cytisus scoparius* (L.) Link subsp. *scoparius* – P caesp – Europ. (Subatl.)
- *Emerus major* Mill. subsp. *major* – NP – Central Europe – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011 as *Coronilla emerus* L.
- *Genista tinctoria* L. – Ch suff – Eurasiat. – Salerni *et al.*, 2011
- *Hippocrepis comosa* L. subsp. *comosa* – H caesp – Central S-Europe
- *Lathyrus aphaca* L. subsp. *aphaca* – T scap – Eurimedit. – Salerni *et al.*, 2011
- *Lathyrus niger* (L.) Bernh. – G rhiz – Europ. Caucas.
- *Lathyrus pratensis* L. subsp. *pratensis* – H scap – Paleotemp.
- *Lathyrus sylvestris* L. subsp. *sylvestris* – H scand – Europ. Caucas. – Salerni *et al.*, 2007; 2011
- *Lathyrus venetus* (Mill.) Wohlf. – G rhiz – Pontic – De Dominicis *et al.*, 1996 – Sabbatini *et al.*, 2011
- *Lotus corniculatus* L. subsp. *corniculatus* – H scap – Paleotemp. (Cosmopol.) – SIENA – Salerni *et al.*, 2007; 2011 as *Lotus corniculatus* L.
- *Lotus herbaceus* (Vill.) Jauzein – H scap – S-Europ. Pont. – Salerni *et al.*, 2007; 2011 as *Dorycnium pentaphyllum* Scop. subsp. *herbaceum* (Vill.) Rouy
- *Lotus hirsutus* L. – Ch suffr – Eurimedit.
- *Lotus tenuis* Waldst. & Kit. ex Willd. – H scap – Paleotemp.
- *Medicago arabica* (L.) Huds. – T scap – Eurimedit.
- *Medicago falcata* L. subsp. *falcata* – H scap – Eurasiat.
- *Medicago lupulina* L. – T scap – Paleotemp. – Salerni *et al.*, 2007; 2011
- *Medicago minima* (L.) L. – T scap – Eurimedit.
- *Medicago orbicularis* (L.) Bartal. – T scap – Eurimedit.
- *Medicago sativa* L. – H scap – Eurasiat. (Stenomedit.) – Salerni *et al.*, 2011
- *Melilotus altissimus* Thuill. – G rhiz – Eurosib. – Salerni *et al.*, 2007; 2011 as *Melilotus altissima* Thuill.
- *Onobrychis viciifolia* Scop. – H scap – Medit. Mont. – Salerni *et al.*, 2007; 2011
- *Ononis pusilla* L. subsp. *pusilla* – H scap – Eurimedit. – SIENA

- *Ononis spinosa* L. s.l. – Ch suffr – Eurimedit. – Salerni *et al.*, 2007; 2011
- *Robinia pseudoacacia* L. – P scap – Non-native
- *Scorpiurus subvillosus* L. – T scap – Eurimedit.
- *Spartium junceum* L. – P caesp – Eurimedit.
- *Sulla coronaria* (L.) Medik. – H scap – W-Medit. – SIENA
- *Trifolium angustifolium* L. subsp. *angustifolium* – T scap – Eurimedit.
- *Trifolium campestre* Schreb. – T scap – Paleotemp. – UTV – Salerni *et al.*, 2007; 2011
- *Trifolium hybridum* L. subsp. *elegans* (Savi) Asch. & Graebn. – H caesp – S-Europ. – SIENA
- *Trifolium ochroleucum* Huds. – H caesp – Pontic – Eurimedit. – UTV – Salerni *et al.*, 2007; 2011
- *Trifolium pallidum* Waldst. & Kit. – T scap – Eurimedit. – UTV
- *Trifolium pratense* L. subsp. *pratense* – H scap – Eurosib. (Subcosmop.) – UTV – Salerni *et al.*, 2007; 2011 as *Trifolium pratense* L.
- *Trifolium repens* L. subsp. *repens* – H rept – Paleotemp. (Subcosmop.) – Salerni *et al.*, 2007; 2011 as *Trifolium repens* L.
- *Trifolium resupinatum* L. – T rept – Paleotemp. – UTV
- *Trifolium scabrum* L. subsp. *scabrum* – T rept – Eurimedit. – UTV
- *Trifolium stellatum* L. – T scap – Eurimedit. – UTV
- *Trifolium striatum* L. subsp. *striatum* – T scap – Paleotemp.
- *Trifolium tomentosum* L. – T rept – Paleotemp. – UTV
- *Vicia ochroleuca* Ten. subsp. *ochroleuca* – H scap – Endemic – UTV
- *Vicia sativa* L. s.l. – T scap – Medit. Turan. (Subcosmop.) – Salerni *et al.*, 2011
- *Vicia sepium* L. – H scap – Eurosib. – Frassinetti & Bottacci, 1997
- *Vicia villosa* Roth subsp. *varia* (Host) Corb. – T scap – Eurimedit.

## Polygalaceae

- *Polygala flavescens* DC. subsp. *flavescens* – H scap – Endemic – SIENA – Salerni *et al.*, 2007; 2011

## Rosaceae

- *Agrimonia eupatoria* L. subsp. *eupatoria* – H scap – Subcosmop. – Salerni *et al.*, 2007; 2011 as *Agrimonia eupatoria* L.
- *Crataegus laevigata* (Poir.) DC. – P caesp – Central Europe – SIENA – Salerni *et al.*, 2007; 2011 as *Crataegus oxyacantha* L. – Sabbatini *et al.*, 2011 as *Crataegus oxyacantha* L.
- *Crataegus monogyna* Jacq. – P caesp – Paleotemp. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007

- *Crataegus ×media* Bechst. – P caesp – Europ. – UTV

Note: The characters of the margin of the lower lobes of the subterminal leaves of fertile branches, and stipules of the leaves of the same branches, coincide with those given by Christensen (1992). The same features are also present in several specimens from Lazio, Puglia and Basilicata (Perelli, 2012) and other Italian regions present in UTV, which we used as references for this nothospecies. Styles 2, seeds 2, and the leaves are rather glossy. This finding is the first for Tuscany (see Fig. 2).

- *Filipendula vulgaris* Moench – H scap – Central Europe S-Sib.

- *Fragaria vesca* L. subsp. *vesca* – H rept – Eurosib. – SIENA – De Dominicis *et al.*, 1996 – Salerni *et al.*, 2007; 2011 as *Fragaria vesca* L. – Frignani & Geri, 2007
- *Geum urbanum* L. – H scap – Circumbor. – Salerni *et al.*, 2007; 2011

- *Potentilla micrantha* Ramond ex DC. – H ros – Eurimedit.

- *Potentilla reptans* L. – H ros – Paleotemp. (Subcosmop.) – Salerni *et al.*, 2007; 2011

- *Poterium sanguisorba* L. subsp. *sanguisorba* – H scap – Paleotemp. (Subcosmop.) – SIENA – De Dominicis *et al.*, 1996 – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007

- *Prunus avium* L. subsp. *avium* – P scap – Pontic – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2011 as *Prunus avium* L.

- *Prunus spinosa* L. subsp. *spinosa* – P caesp – Europ. Caucas. – Salerni *et al.*, 2007; 2011 as *Prunus spinosa* L.
- *Pyracantha coccinea* M.Roem. – P caesp – Stenomedit. – Salerni *et al.*, 2007; 2011

- *Pyrus communis* L. – P caesp – Eurasiat. – SIENA – Salerni *et al.*, 2007; 2011 as *Pyrus pyraeaster* Burgsd. – Frignani & Geri, 2007 as *Pyrus pyraeaster* Burgsd.

- *Rosa agrestis* Savi – NP – Eurimedit.

- *Rosa arvensis* Huds. – NP – Submedit. Subatl. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007

- *Rosa canina* L. – NP – Paleotemp. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011 as *Rosa canina* L. sensu Bouleng. – Frignani & Geri, 2007

- *Rubus glandulosus* Bellardi aggr. – NP – Central Europe S-Europ. – De Dominicis *et al.*, 1996 as *Rubus hirtus* W. et K. – Frassinetti & Bottacci, 1997 as *Rubus hirtus* W. et K. – Salerni *et al.*, 2007; 2011 as *Rubus hirtus* W. et K. – Frignani & Geri, 2007 as *Rubus hirtus* W. et K.

- *Rubus ulmifolius* Schott – NP – Eurimedit. – Salerni *et al.*, 2007; 2011

- *Sorbus torminalis* (L.) Crantz – P scap – Paleotemp. – De Dominicis *et al.*, 1996 – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007

## Ulmaceae

- *Ulmus minor* Mill. subsp. *minor* – P scap – Europ. Caucas. – De Dominicis *et al.*, 1996 – Salerni *et al.*, 2007; 2011 as *Ulmus minor* Miller – Frignani & Geri, 2007

## Moraceae

- *Ficus carica* L. – P caesp – Medit. Turan.

## Urticaceae

- *Parietaria officinalis* L. – H scap – Central Europe W-Asiat. – SIENA; UTV

- *Urtica dioica* L. subsp. *dioica* – H scap – Subcosmop. – Frassinetti & Bottacci, 1997

## Fagaceae

- *Fagus sylvatica* L. subsp. *sylvatica* – P scap – Central Europe – Negri, 1930 – Masi, 1974 – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007 – Sabbatini *et al.*, 2011

- *Quercus cerris* L. – P scap – N-Eurimedit. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007 – Sabbatini *et al.*, 2011

- *Quercus pubescens* Willd. subsp. *pubescens* – P scap – SE-Europ. (Subpont.) – De Dominicis *et al.*, 1996 – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007

## Betulaceae

- *Alnus cordata* (Loisel.) Loisel. – P scap – Culta – SIENA

- *Carpinus betulus* L. – P scap – Central Europe Caucas. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007

- *Corylus avellana* L. – P caesp – Europ. Caucas. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007

- *Ostrya carpinifolia* Scop. – P scap – Circumbor. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007 – Sabbatini *et al.*, 2011

## Celastraceae

- *Euonymus europaeus* L. – P caesp – Eurasiat. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007 – Sabbatini *et al.*, 2011

## Euphorbiaceae

- *Euphorbia dulcis* L. – G rhiz – Central Europe – SIENA – De Dominicis *et al.*, 1996

- *Mercurialis perennis* L. – G rhiz – Europ. Caucas. – SIENA – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007 – Sabbatini *et al.*, 2011



## Salicaceae

- *Salix alba* L. – P scap – Paleotemp. – Salerni *et al.*, 2007; 2011
- *Salix apennina* A.K.Skvortsov – NP – Subendemic – SIENA
- *Salix purpurea* L. subsp. *purpurea* – P caesp – Eurasiat. Temp. – De Dominicis *et al.*, 1996 – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007

## Violaceae

- *Viola alba* Besser subsp. *debnhardtii* (Ten.) W.Becker – H ros – Eurimedit. – Frassinetti & Bottacci, 1997 as *Viola alba* Besser – Salerni *et al.*, 2007; 2011 as *Viola alba* Besser – Sabbatini *et al.*, 2011
- *Viola hirta* L. – H ros – Europ. – UTV
- *Viola odorata* L. – H ros – Eurimedit. – SIENA; UTV
- *Viola reichenbachiana* Jord. ex Boreau – H scap – Eurosib. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007 – Salerni *et al.*, 2011

## Linaceae

- *Linum bienne* Mill. – H bienn – Eurimedit. Subatl. – Salerni *et al.*, 2007; 2011
- *Linum corymbulosum* Rchb. – T scap – Stenomedit.
- *Linum tenuifolium* L. – Ch suffr – Submedit. Pontic – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007

## Hypericaceae

- *Hypericum perforatum* L. subsp. *veronense* (Schrank) A.Fröhl. – H scap – Paleotemp. (Subcosmop.) – SIENA – Salerni *et al.*, 2007; 2011

## Geraniaceae

- *Erodium acaule* (L.) Bech. & Thell. – H ros – Medit. Mont. – SIENA
- *Erodium cicutarium* (L.) L'Her. – T scap – Subcosmop. – SIENA
- *Erodium malacoides* (L.) L'Hér. subsp. *malacoides* – T scap – Medit. Macarones.
- *Geranium columbinum* L. – T scap – Europ. S-Sib. – Salerni *et al.*, 2011
- *Geranium lucidum* L. – T scap – Eurimedit. – SIENA
- *Geranium nodosum* L. – G rhiz – N-Medit. Mont. – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007
- *Geranium robertianum* L. – T scap – Subcosmop. – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011 – Sabbatini *et al.*, 2011

## Onagraceae

- *Epilobium montanum* L. – H scap – Eurasiat.

## Sapindaceae

- *Acer campestre* L. – P scap – Europ. Caucas. – De Dominicis *et al.*, 1996 – Salerni *et al.*, 2007 – Frignani & Geri, 2007

- *Acer opalus* Mill. subsp. *obtusatum* (Waldst. & Kit. ex Willd.) Gams – P scap – SE-Europ. – De Dominicis *et al.*, 1996 as *Acer obtusatum* W. et K. – Frassinetti & Bottacci, 1997 as *Acer opulifolium* Chaix – Salerni *et al.*, 2007; 2011 as *Acer obtusatum* W. et K. – Frignani & Geri, 2007 – Sabbatini *et al.*, 2011 as *Acer obtusatum* W. et K.

- *Acer pseudoplatanus* L. – P scap – Europ. Caucas. – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007

- *Aesculus hippocastanum* L. – P scap – Culta

## Malvaceae

- *Althaea hirsuta* L. – T scap – Eurimedit. – Salerni *et al.*, 2011
- *Malva sylvestris* L. subsp. *sylvestris* – H scap – Eurosib. – SIENA
- *Tilia cordata* Mill. – P scap – Europ. Caucas. – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007

## Thymelaeaceae

- *Daphne laureola* L. – P caesp – Submedit. Subatlant. – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011

## Cistaceae

- *Cistus creticus* L. subsp. *eriocephalus* (Viv.) Greuter & Burdet – NP – Stenomedit.
- *Helianthemum apenninum* (L.) Mill. subsp. *apenninum* – Ch suffr – SW-Europ. – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007
- *Helianthemum nummularium* (L.) Mill. – Ch suffr – Europ. Caucas. – Salerni *et al.*, 2007; 2011

## Brassicaceae

- *Alyssum alyssoides* (L.) L. – T scap – Eurimedit. – SIENA
- *Arabis collina* Ten. subsp. *collina* – H scap – Medit. Mont. – Salerni *et al.*, 2007; 2011
- *Arabis hirsuta* (L.) Scop. – H bienn – Europ.
- *Arabis sagittata* (Bertol.) DC. – H bienn – SE-Europ. – SIENA
- *Capsella bursa-pastoris* (L.) Medik. subsp. *bursa-pastoris* – H bienn – Cosmopol. – SIENA
- *Cardamine heptaphylla* (Vill.) O.E.Schulz – G rhiz – Subatl. SW-Europ. – SIENA – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007 – Sabbatini *et al.*, 2011
- *Erysimum marmemmanum* Peccenini & Polatschek – H bienn – Endemic
- *Pseudoturritis turrita* (L.) Al-Shehbaz – H bienn – S-Europ.

## Santalaceae

- *Thesium humifusum* DC. – H scap – Eurimedit. – SIENA – Salerni *et al.*, 2007; 2011 as *Thesium divaricatum* Jan
- *Thesium linophyllum* L. – H scap – SE-Europ. – Salerni *et al.*, 2007; 2011

## Loranthaceae

- *Loranthus europaeus* Jacq. – P ep – Europ. Caucas. – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007

## Polygonaceae

- *Rumex sanguineus* L. – H scap – Europ. Caucas. – SIENA

## Caryophyllaceae

- *Arenaria serpyllifolia* L. subsp. *serpyllifolia* – T scap – Subcosmop.

- *Cerastium arvense* L. subsp. *arvense* – H scap – Paleotemp. (Subcosmop.) – SIENA

Note: *C. scaranoi* has been often reported from Tuscany, but most probably due to confusion with *C. arvense* (G. Barberis, pers. comm.).

- *Cerastium glomeratum* Thuill. – T scap – Eurimedit. (Subcosmop.)

- *Cerastium pumilum* Curtis – T scap – Eurimedit. – SIENA

- *Dianthus carthusianorum* L. – H scap – Central S-Europ. – SIENA – Salerni *et al.*, 2007

- *Dianthus longicaulis* Ten. – H scap – Medit. Mont. – Salerni *et al.*, 2011

- *Moehringia trinervia* (L.) Clairv. – T scap – Eurasiat. – SIENA – Frassinetti & Bottacci, 1997 – Sabbatini *et al.*, 2011

- *Petrorhagia saxifraga* (L.) Link subsp. *saxifraga* – H caesp – Eurimedit.

- *Silene otites* (L.) Wibel subsp. *otites* – H ros – Eurasiat.

- *Silene paradoxa* L. – H ros – N-Medit. Mont.

- *Silene viridiflora* L. – H ros – S-Europ. C-Asiat.

- *Silene vulgaris* (Moench) Garcke subsp. *tenoreana* (Colla) Soldano & F.Conti – H scap – Stenomedit. Orient. – Salerni *et al.*, 2007; 2011 as *Silene vulgaris* (Moench) Garcke subsp. *angustifolia* (Miller) Hayek – SIENA

- *Stellaria media* (L.) Vill. subsp. *media* – T rept – Cosmopol. – SIENA

## Cornaceae

- *Cornus mas* L. – P caesp – Pontic SE-Europ. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007

- *Cornus sanguinea* L. subsp. *hungarica* (Kárpáti) Soó – P caesp – Eurasiat. Temp. – Salerni *et al.*, 2007; 2011 as *Cornus sanguinea* L.

Note: According to Roma-Marzio *et al.* (2016), *C. sanguinea* subsp. *hungarica* is the only subspecies occurring in Tuscany.

## Primulaceae

- *Cyclamen hederifolium* Aiton subsp. *hederifolium* – G bulb – N-Medit. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007

- *Cyclamen repandum* Sm. subsp. *repandum* – G bulb – N-Medit.

- *Lysimachia arvensis* (L.) U.Manns. & Anderb. – T rept – Eurimedit. (Subcosmop.) – Salerni *et al.*, 2011

- *Primula vulgaris* Huds. subsp. *vulgaris* – H ros – Europ. Caucas. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007

## Ericaceae

- *Monotropa hypopitys* L. – G par – Circumbor. – SIENA; UTV – Salerni *et al.*, 2007; 2011

Note: Identified according to the characters provided by Bonari *et al.* (2016a).

## Rubiaceae

- *Cruciata glabra* (L.) Ehrend. – H scap – Eurasiat.

- *Galium aparine* L. – T scap – Eurasiat. – Salerni *et al.*, 2011

- *Galium corrudifolium* Vill. – H scap – Stenomedit. – Salerni *et al.*, 2007; 2011

- *Galium mollugo* L. subsp. *erectum* Syme – H scap – W-Eurasiat. – Salerni *et al.*, 2007; 2011 as *Galium album* Miller

- *Galium odoratum* (L.) Scop. – G rhiz – Eurasiat. – SIENA – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 as *Asperula odorata* L. – Frignani & Geri, 2007 – Sabbatini *et al.*, 2011 – Salerni *et al.*, 2011

- *Galium verum* L. subsp. *verum* – H scap – Eurasiat. – Salerni *et al.*, 2007; 2011 as *Galium verum* L.

- *Sherardia arvensis* L. – T scap – Eurimedit. (Subcosmop.) – SIENA

## Gentianaceae

- *Blackstonia perfoliata* (L.) Huds. subsp. *perfoliata* – T scap – Eurimedit. – SIENA – Salerni *et al.*, 2007; 2011 as *Blackstonia perfoliata* (L.) Hudson

- *Centaurium erythraea* Rafn subsp. *erythraea* – H bienn – Paleotemp.

## Boraginaceae

- *Aegonychon purpureocaeruleum* (L.) Holub – H scap – Pontic S-Europ. – Salerni *et al.*, 2007; 2011 as *Buglossoides purpureocaerulea* (L.) I.M.Johnst.

- *Buglossoides arvensis* (L.) I.M.Johnst. subsp. *arvensis* – T scap – Eurimedit.

- *Echium vulgare* L. subsp. *vulgare* – H bienn – Europ. – SIENA

- *Pulmonaria hirta* L. subsp. *hirta* – H scap – Subendemic – SIENA – De Dominicis *et al.*, 1996 as *Pulmonaria saccharata* Miller – Frignani & Geri, 2007.

- *Symphytum tuberosum* L. subsp. *angustifolium* (A.Kern.) Nyman – G rhiz – SE-Europ. (Subpont.) – Frassinetti & Bottacci, 1997 as *Symphytum tuberosum* L.

## Convolvulaceae

- *Convolvulus arvensis* L. – G rhiz – Paleotemp. (Subcosmop.) – SIENA – Salerni *et al.*, 2007; 2011



- *Convolvulus cantabrica* L. – H scap – Eurimedit. – SIENA – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007
- *Cuscuta planiflora* Ten. – T par – Eurimedit. – SIENA

#### Solanaceae

- *Atropa bella-donna* L. – H scap – Medit. Mont. – SIENA – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007

#### Oleaceae

- *Fraxinus angustifolia* Vahl subsp. *oxycarpa* (Willd.) Franco & Rocha Afonso – P scap – SE-Europ. (Pont.) – SIENA
- *Fraxinus ornus* L. subsp. *ornus* – P scap – S-Europ. S-Sib. – Salerno *et al.*, 2007; 2011 as *Fraxinus ornus* L.
- *Ligustrum vulgare* L. – NP – Europ. W-Asiat. – De Dominicis *et al.*, 1996 – Salerno *et al.*, 2007; 2011 – Frignani & Geri, 2007

#### Plantaginaceae

- *Digitalis micrantha* Roth ex Schweigg. – H scap – Endemic – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007 – Salerno *et al.*, 2011
- *Globularia bisnagarica* L. – H scap – S-Europ. (Mont.) – SIENA
- *Plantago lanceolata* L. – H ros – Eurasiat. (Cosmopol.) – Salerno *et al.*, 2007; 2011
- *Plantago major* L. subsp. *major* – H ros – Eurasiat. (Subcosmopol.)
- *Plantago maritima* L. subsp. *maritima* – H ros – S-Sib. Central Europe – SIENA – Salerno *et al.*, 2011
- *Veronica arvensis* L. – T scap – Subcosmop. – UTV
- *Veronica hederifolia* L. subsp. *hederifolia* – T scap – Eurasiat. – SIENA
- *Veronica persica* Poir. – T scap – Subcosmop. – SIENA
- *Veronica prostrata* L. subsp. *prostrata* – H caesp – Eurasiat. (Subcontinent.) – SIENA – Salerno *et al.*, 2011 as *Veronica prostrata* L.

#### Lamiaceae

- *Ajuga reptans* L. – H rept – Europ. Caucas. – SIENA – Frassinetti & Bottacci, 1997 – Salerno *et al.*, 2007; 2011
- *Betonica officinalis* L. – SIENA – H scap – Europ. Caucas. – Salerno *et al.*, 2011
- *Clinopodium acinos* (L.) Kuntze subsp. *acinos* – T scap – Eurimedit. – Salerno *et al.*, 2007; 2011 as *Acinos arvensis* (Lam.) Dandy
- *Clinopodium vulgare* L. subsp. *vulgare* – H scap – Circumbor. – Salerno *et al.*, 2007; 2011 as *Clinopodium vulgare* L.
- *Lamium amplexicaule* L. – T scap – Paleotemp. – SIENA
- *Lamium bifidum* Cirillo subsp. *bifidum* – T scap – Stenomedit. – SIENA

- *Lamium garganicum* L. subsp. *laevigatum* Arcang. – T scap – Medit. Mont. – SIENA
- *Lamium maculatum* L. – H scap – Eurasiat. Temp. – SIENA – Frassinetti & Bottacci, 1997
- *Lycopus europaeus* L. subsp. *europaeus* – H scap – Paleotemp. (Circumbor.)
- *Marrubium vulgare* L. – H scap – Eurimedit. S-Sib. (Subcosmop.)
- *Melittis melissophyllum* L. subsp. *melissophyllum* – H scap – Central Europe – Frassinetti & Bottacci, 1997
- *Prunella laciniata* (L.) L. – H scap – Eurimedit. – Salerno *et al.*, 2007; 2011
- *Prunella vulgaris* L. subsp. *vulgaris* – H scap – Circumbor. – Salerno *et al.*, 2007; 2011 as *Prunella vulgaris* L.
- *Salvia pratensis* L. subsp. *pratensis* – H scap – Eurimedit.
- *Salvia verbenaca* L. – H scap – Medit. Atl. – Salerno *et al.*, 2007; 2011
- *Stachys germanica* L. subsp. *salviifolia* (Ten.) Gams – H scap – NE-Medit.
- *Stachys romana* (L.) E.H.L.Krause subsp. *romana* – T scap – Stenomedit.
- *Teucrium capitatum* L. subsp. *capitatum* – Ch suffr – Stenomedit.
- *Teucrium chamaedrys* L. subsp. *chamaedrys* – Ch suffr – Eurimedit. – SIENA – De Dominicis *et al.*, 1996 – Salerno *et al.*, 2007; 2011 – Frignani & Geri, 2007 as *Teucrium chamaedrys* L.
- *Teucrium scorodonia* L. – H scap – W-Europ. (Subatl.) – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007 – Salerno *et al.*, 2011

Note: The presence of this unit and the closely related *T. siculum* (Raf.) Guss. subsp. *siculum* is possible because these taxa are both at the limit of their distribution range. Co-existence is also possible due to their similar habitat requirements.

- *Teucrium siculum* (Raf.) Guss. subsp. *siculum* – H scap – Subendemic – SIENA; FI

Note: Second report for the province of Siena. The first record was by Scoppola & Bascietto (2002).

- *Thymus longicaulis* C. Presl subsp. *longicaulis* – Ch rept – Eurimedit. – Salerno *et al.*, 2007; 2011 as *Thymus longicaulis* Presl

#### Orobanchaceae

- *Bellardia trixago* (L.) All. – T scap – Eurimedit.
- *Orobanche minor* Sm. – T par – Paleotemp. (Subcosmop.) – SIENA
- *Rhinanthus alectorolophus* (Scop.) Pollich subsp. *alectorolophus* – T scap – Central Europe

#### Verbenaceae

- *Verbena officinalis* L. – H scap – Paleotemp. (Cosmopol.) – SIENA

## Campanulaceae

- *Campanula persicifolia* L. subsp. *persicifolia* – H scap – Eurasiat. – SIENA
- *Campanula rapunculus* L. – H bienn – Paleotemp. – Salerni *et al.*, 2007; 2011
- *Campanula trachelium* L. subsp. *trachelium* – H scap – Paleotemp. – SIENA – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997
- *Legousia hybrida* (L.) Delarbre – T scap – Atl. (Eurimedit.) – UTV

## Asteraceae

- *Achillea ageratum* L. – H scap – Stenomedit. Occ. – SIENA
  - *Achillea collina* Becker ex Rchb.f. – H scap – SE-Europ. – Salerni *et al.*, 2007; 2011
  - *Anthemis arvensis* L. subsp. *arvensis* – T scap – Stenomedit. (Subcosmop.)
  - *Arctium minus* (Hill) Bernh. – H bienn – Europ. (Eurimedit.) – SIENA
  - *Arctium nemorosum* Lej. – H bienn – Europ. (Subatl.)
  - *Artemisia verlotiorum* Lamotte – H scap – Non-native – SIENA
  - *Bellis annua* L. subsp. *annua* – T scap – Stenomedit. Macarones.
  - *Bellis perennis* L. – H ros – Europ. Caucas. (Circumbor.)
  - *Bellis sylvestris* Cirillo – H ros – Stenomedit.
  - *Bombycilaena erecta* (L.) Smoljan. – T scap – S-Europ. S-Siber.
  - *Carduus nutans* L. subsp. *macrolepis* (Peterm.) Kazmi – H bienn – W-Europ. – SIENA
  - *Carlina corymbosa* L. – H scap – Stenomedit. – SIENA – Salerni *et al.*, 2007; 2011
  - *Centaurea arrigonii* Greuter (≡ *Centaurea intermedia* (Micheletti) Arrigoni [non Mutel 1846]; ≡ *Centaurea maculosa* f. *intermedia* Micheletti) – H scap – Endemic – SIENA
- Note: The distribution of this Italian endemic species has classically been considered to be in Tuscany but it is also found in Emilia Romagna, Marche and Umbria (Peruzzi *et al.*, 2014; 2015).
- *Centaurea jacea* L. subsp. *gaudini* (Boiss. & Reut.) Gremli – H scap – SE-Europ. – SIENA
  - *Cichorium intybus* L. – H scap – Cosmop.
  - *Cirsium arvense* (L.) Scop. – G rad – Eurasiat. Temp.
  - *Cirsium tenoreanum* Petr. – H bienn – Endemic – SIENA – Salerni *et al.*, 2011
  - *Cirsium vulgare* (Savi) Ten. – H bienn – Paleotemp. (Subcosmop.) – SIENA
  - *Cota tinctoria* (L.) J.Gay s.l. – H bienn – Central Europe Pont. – Salerni *et al.*, 2007; 2011 as *Anthemis tinctoria* L.

Note: The subspecies identification in the field was not possible.

- *Crepis leontodontoides* All. – H scap – W-Medit. Mont.
- *Crepis vesicaria* L. – T scap – Submedit. Subatl.
- *Dittrichia viscosa* (L.) Greuter subsp. *viscosa* – H scap – Eurimedit. – Salerni *et al.*, 2011 as *Inula viscosa* (L.) Aiton
- *Echinops sicutus* Strobl – H scap – Endemic – Salerni *et al.*, 2007; 2011 as *Echinops ritro* L.
- *Eupatorium cannabinum* L. subsp. *cannabinum* – H scap – Paleomp. – Salerni *et al.*, 2007; 2011
- *Helichrysum italicum* (Roth) G.Don subsp. *italicum* – Ch suffr – S-Europ. – Salerni *et al.*, 2007; 2011
- *Helminthotheca echioides* (L.) Holub – T scap – Eurimedit.
- *Hieracium murorum* L. – H scap – Europ. – De Dominicis *et al.*, 1996 as *Hieracium murorum* Auct. – Frassinetti & Bottacci, 1997 as *Hieracium murorum* Auct. – Frignani & Geri, 2007 as *Hieracium murorum* Auct. – Sabbatini *et al.*, 2011 as *Hieracium sylvaticum* L.
- *Inula conyzae* (Griess.) Meikle – H bienn – Medioeurop. W-Asiat. – SIENA – Salerni *et al.*, 2011
- *Inula montana* L. – H scap – W-Medit. Mont. – SIENA – Salerni *et al.*, 2007; 2011
- *Jacobaea erucifolia* (L.) G.Gaertn., B.Mey. & Scherb. subsp. *erucifolia* – H scap – Eurasiat. – SIENA – Salerni *et al.*, 2011
- *Lactuca muralis* (L.) Gaertn. – H scap – Europ. Caucas. – De Dominicis *et al.*, 1996 as *Mycelis muralis* (L.) Dumort – Frassinetti & Bottacci, 1997 as *Mycelis muralis* (L.) Dumort – Sabbatini *et al.*, 2011 as *Mycelis muralis* (L.) Dumort.
- *Leucanthemum pallens* (Perreym.) DC. – H scap – Eurimedit.
- *Leucanthemum vulgare* (Vaill.) Lam. subsp. *vulgare* – H scap – Eurosib. – Salerni *et al.*, 2007; 2011 as *Leucanthemum vulgare* Lam. var. *vulgare*
- *Matricaria chamomilla* L. – T scap – Subcosmop. – SIENA
- *Picris hieracioides* L. subsp. *hieracioides* – H scap – Eurosib. – SIENA – Salerni *et al.*, 2007; 2011
- *Pilosella officinarum* Vaill. – H ros – Europ. Caucas. (Subatl.) – De Dominicis *et al.*, 1996 – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007
- *Pilosella piloselloides* (Vill.) Soják – H scap – Europ. Caucas. – Salerni *et al.*, 2011
- *Pulicaria dysenterica* (L.) Bernh. – H scap – Eurimedit. – Salerni *et al.*, 2007; 2011
- *Rhagadiolus stellatus* (L.) Gaertn. – T scap – Eurimedit.
- *Scorzonera laciniata* L. subsp. *decumbens* (Guss.) Gemeinholzer & Greuter – H bienn – Paleotemp.
- *Scorzoneroideis cichoriacea* (Ten.) Greuter – H ros – Orophil. SE-Europ.
- *Sonchus asper* (L.) Hill subsp. *asper* – T scap – Eurasiat. (Subcosmop.) – Salerni *et al.*, 2011

- *Sonchus oleraceus* L. – T scap – Eurasiat. (Subcosmop.) – SIENA – Salerni *et al.*, 2007; 2011
- *Taraxacum* sect. *Taraxacum* – H ros – Circumbor.
- *Tragopogon porrifolius* L. subsp. *porrifolius* – H bienn – Eurimedit. – Salerni *et al.*, 2007; 2011 as *Tragopogon porrifolius* L.
- *Tragopogon samaritani* Heldr. & Sart. ex Boiss. – H bienn – Orofil. SE-Europ.
- *Tussilago farfara* L. – G rhiz – Paleotemp. – Salerni *et al.*, 2007; 2011
- *Urospermum dalechampii* (L.) F.W.Schmidt – H scap – Eurimedit.
- *Xanthium orientale* L. subsp. *italicum* (Moretti) Greuter – T scap – S-Europ. – SIENA
- *Xeranthemum cylindraceum* Sm. – T scap – S-Sib. S-Europ. – SIENA – Salerni *et al.*, 2011

#### Adoxaceae

- *Adoxa moschatellina* L. subsp. *moschatellina* – G rhiz – Circumbor.
- *Sambucus ebulus* L. – G rhiz – Eurimedit. – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007 – Salerni *et al.*, 2011

#### Caprifoliaceae

- *Dipsacus fullonum* L. – H bienn – Eurimedit.
- *Knautia arvensis* (L.) Coult. – H scap – Eurasiat. – SIENA
- *Knautia integrifolia* (L.) Bertol. subsp. *integrifolia* – T scap – Eurimedit. – Salerni *et al.*, 2007; 2011
- *Lonicera caprifolium* L. – P lian – SE-Europ. (Pontic) – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011
- *Lonicera etrusca* Santi – P lian – Eurimedit.
- *Scabiosa uniseta* Savi – H scap – Endemic – SIENA – De Dominicis *et al.*, 1996 – Salerni *et al.*, 2011
- *Sixalix atropurpurea* (L.) Greuter et Burdet subsp. *grandiflora* (Scop.) Soldano et F.Conti – H bienn – Stenomedit. – SIENA

#### Araliaceae

- *Hedera helix* L. subsp. *helix* – P lian – Submedit. Subatl. – SIENA – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011 – Sabbatini *et al.*, 2011

#### Apiaceae

- *Bupleurum baldense* Turra – T scap – Eurimedit. – SIENA; UTV
- *Chaerophyllum temulum* L. – T scap – Eurasiat. – SIENA
- *Daucus carota* L. subsp. *carota* – H bienn – Paleotemp. (Subcosmop.) – Salerni *et al.*, 2007; 2011 as *Daucus carota* L.
- *Eryngium campestre* L. – H scap – Eurimedit. – De Dominicis *et al.*, 1996 – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007

- *Foeniculum vulgare* Mill. – H scap – S-Medit.
- *Oenanthe pimpinelloides* L. – H scap – Medit. Atl.
- *Physospermum cornubiense* (L.) DC. – H scap – Submedit. Subatl. – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007
- *Sanicula europaea* L. – H scap – Orofil. Paleotemp. Paleotrop. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011 – Sabbatini *et al.*, 2011
- *Sison amomum* L. – H bienn – Submedit. Subatl. – UTV
- *Torilis arvensis* (Huds.) Link – T scap – Subcosmop. – Salerni *et al.*, 2007; 2011
- *Torilis japonica* (Houtt.) DC. – T scap – Paleotemp. (Subcosmop.) – SIENA – Salerni *et al.*, 2011

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##### EQUISETIDAE

##### Equisetaceae

- ◆ *Equisetum arvense* L. – G rhiz – Circumbor. – Salerni *et al.*, 2011

##### POLYPODIIDAE

##### Dryopteridaceae

- ◆ *Dryopteris filix-mas* (L.) Schott – G rhiz – Subcosmop. – Frassinetti & Bottacci, 1997

##### Polypodiaceae

- ◆ *Polypodium interjectum* Shivas – H ros – Paleotrop. – Frassinetti & Bottacci, 1997

##### MAGNOLIIDAE

##### Liliaceae

- ◆ *Lilium martagon* L. – G bulb – Eurasiat. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007 – Sabbatini *et al.*, 2011

##### Orchidaceae

- ◆ *Anacamptis morio* (L.) R.M.Bateman, Pridgeon & M.W.Chase – G bulb – Europ. Caucas. – Frignani, 2011 as *Orchis morio* L.
  - ◆ *Cephalanthera longifolia* (L.) Fritsch – G rhiz – Eurasiat. – Frassinetti & Bottacci, 1997 – Frignani, 2011 – Salerni *et al.*, 2011
  - ◆ *Dactylorhiza insularis* (Sommier) Landwehr – G bulb – Stenomedit. Occ. – Frignani, 2011
- Note: Very rare species in Southern Tuscany. It has only previously been recorded from Monte Amiata, Monte Cetona and Cornate di Gerfalco (Contorni, 1992; Selvi, 1996; 2010; Mazzeschi & Selvi, 1999; Frignani 2011).
- ◆ *Dactylorhiza maculata* (L.) Soó subsp. *fuchsii* (Druce)



Hyl. – G bulb – Paleotemp. – Frassinetti & Bottacci, 1997 as *Orchis maculata* L. – Frignani, 2011 – Salerni *et al.*, 2011 as *Orchis maculata* L.

♦ *Dactylorhiza romana* (Sebast.) Soó subsp. *romana* – G bulb – Stenomedit. – Frignani, 2011

♦ *Gymnadenia conopsea* (L.) R.Br. – G bulb – Eurasiat. – Salerni *et al.*, 2007; 2011 – Frignani, 2011

♦ *Limodorum abortivum* (L.) Sw. – G rhiz – Eurimedit. – Frignani, 2011

♦ *Listera ovata* (L.) R.Br. – G rhiz – Eurasiat. – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2011

♦ *Neotinea tridentata* (Scop.) R.M.Bateman, Pridgeon & M.W.Chase – G bulb – Eurimedit. – Frignani, 2011 as *Orchis tridentata* Scop.

♦ *Ophrys apifera* Huds. – G bulb – Eurimedit. – Frignani, 2011

♦ *Ophrys bertolonii* Moretti subsp. *bertolonii* – G rhiz – Stenomedit. Occ. – Frignani, 2011 – Salerni *et al.*, 2011

♦ *Ophrys classica* Devillers-Tersch. & Devillers – G bulb – Eurimedit. – Frignani, 2011 as *O. sphogodes* Mill.

♦ *Ophrys insectifera* L. – G bulb – Europ. – Frignani, 2011

♦ *Orchis provincialis* Balb. ex Lam. & DC. – G bulb – Stenomedit. – Frignani, 2011

♦ *Orchis purpurea* Huds. – G bulb – Eurasiat. – Salerni *et al.*, 2007; 2011 – Frignani, 2011

♦ *Orchis simia* Lam. – G bulb – Eurimedit. – Frignani, 2011

♦ *Platanthera bifolia* (L.) Rchb. – G bulb – Paleotemp. – Frignani, 2011.

#### Iridaceae

♦ *Gladiolus italicus* Mill. – G bulb – Eurimedit. – Salerni *et al.*, 2007; 2011

#### Amaryllidaceae

♦ *Galanthus nivalis* L. – G bulb – Europ. Caucas. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007

♦ *Narcissus poëticus* L. – G bulb – Orofil. S-Europ. – Salerni *et al.*, 2011

#### Asparagaceae

♦ *Loncomelos brevistylus* (Wolfn.) Dostál – G bulb – SE-Europ. W-Asiatic – Salerni *et al.*, 2007; 2011 as *Ornithogalum pyramidale* L.

♦ *Ornithogalum divergens* Boreau – G bulb – Eurimedit. – Salerni *et al.*, 2011

#### Juncaceae

♦ *Juncus conglomeratus* L. – H caesp – Eurosib. – Salerni *et al.*, 2011

♦ *Luzula forsteri* (Sm.) DC. – H caesp – Eurimedit. – Frassinetti & Bottacci, 1997

#### Poaceae

♦ *Agrostis stolonifera* L. – H rept – Circumbor. – Salerni *et al.*, 2011

♦ *Arundo plinii* Turra (= *A. collina* Ten.) – G rhiz – Stenomedit. – Salerni *et al.*, 2007; 2011 as *Arundo pliniana* Turra

Note: *Arundo collina* Ten. is currently considered as a synonym of *A. plinii* Turra in the recent revision, on the basis of molecular analysis, by Hardion *et al.* (2012).

♦ *Briza minor* L. – T scap – Subcosmop. – Salerni *et al.*, 2011

♦ *Dactylis glomerata* L. subsp. *hispanica* (Roth) Nyman – H caesp – Stenomedit. – Salerni *et al.*, 2011 as *Dactylis hispanica* Roth

♦ *Danthonia decumbens* (L.) DC. subsp. *decumbens* – H caesp – Europ. – Salerni *et al.*, 2011

♦ *Deschampsia flexuosa* (L.) Trin. – H caesp – Subcosmop. Temp. – Frassinetti & Bottacci, 1997

♦ *Elymus repens* (L.) Gould. subsp. *repens* – G rhiz – Circumbor. – Salerni *et al.*, 2011 as *Agropyron repens* (L.) Beauv.

♦ *Festuca heterophylla* Lam. – H caesp – Europ. Caucas. – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007 – Salerni *et al.*, 2011

? *Hordelymus europaeus* (L.) Harz – H caesp – Europ. Caucas. – Frassinetti & Bottacci, 1997

Note: The presence of this species is questionable as it usually occurs in the Apennines in the northern part of Tuscany.

♦ *Phleum nodosum* L. – H caesp – Eurimedit. – Salerni *et al.*, 2007; 2011 as *Phleum bertolonii* DC.

♦ *Poa nemoralis* L. subsp. *nemoralis* – H caesp – Circumbor. – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007

♦ *Poa trivialis* L. subsp. *sylvicola* (Guss.) H.Lindb. – H caesp – Eurimedit. – Salerni *et al.*, 2007; 2011 as *Poa sylvicola* Guss.

♦ *Trachynia distachya* (L.) Link – T scap – Stenomedit. Turan. – Salerni *et al.*, 2011 as *Brachypodium distachyon* (L.) P.Beauv.

#### Ranunculaceae

♦ *Actaea spicata* L. – G rhiz – Eurasiat. Temp. – Frassinetti & Bottacci, 1997

♦ *Anemonoides nemorosa* (L.) Holub – G rhiz – Circumbor. – De Dominicis *et al.*, 1996 as *Anemone nemorosa* L. – Frassinetti & Bottacci, 1997 as *Anemone nemorosa* L. – Frignani & Geri, 2007 as *Anemone nemorosa* L.

♦ *Ranunculus bulbosus* L. – H scap – Eurasiat. – Salerni *et al.*, 2011

#### Saxifragaceae

♦ *Saxifraga rotundifolia* L. subsp. *rotundifolia* – H scap – Orofil. S-Europ. Caucas. – Frassinetti & Bottacci, 1997

## Fabaceae

♦ *Astragalus monspessulanus* L. subsp. *monspessulanus* – H ros – Eurimedit. – De Dominicis *et al.*, 1996 as *Astragalus monspessulanum* – Frignani & Geri, 2007 – Salerni *et al.*, 2011

? *Hippocrepis multisiliquosa* L. – T scap – Stenomedit. – Salerni *et al.*, 2011

Note: This species does not occur in continental Italy. The record is likely a mis-identification. No voucher specimen is available in SIENA to verify the taxon.

♦ *Laburnum anagyroides* Medik. – P caesp – S-Europ. – Sabbatini *et al.*, 2011

♦ *Lathyrus annuus* L. – T scap – Eurimedit. – Salerni *et al.*, 2011

♦ *Lathyrus cicera* L. – T scap – Eurimedit. – Salerni *et al.*, 2011

♦ *Lathyrus latifolius* L. – T scand – S-Europ. – Salerni *et al.*, 2007; 2011

♦ *Lathyrus linifolius* (Reichard) Bässler – G rhiz – Central Europe

♦ *Lathyrus sphaericus* Retz. – T scap – Eurimedit. – Salerni *et al.*, 2011

? *Lathyrus vernus* (L.) Bernh. – G rhiz – Eurasiat. – Frassinetti & Bottacci, 1997

Note: Probably this entity should be referred to *L. venetus* (Mill.) Wohlf.

? *Lotus dorycnium* L. – H scap – S-Europ. – Salerni *et al.*, 2007; 2011 as *Dorycnium pentaphyllum* Scop.

Note: This unit should be referred to *Lotus herbaceus* (Vill.) Jauzein.

♦ *Melilotus sulcatus* Desf. – T scap – S-Medit. – Salerni *et al.*, 2011 as *Melilotus sulcata* Desf.

? *Ononis natrix* L. – H caesp – Eurimedit. – Salerni *et al.*, 2011

Note: This species has never been observed before in Southern Tuscany. This record probably relates to another species (possibly *O. pusilla* L.).

♦ *Trifolium repens* L. subsp. *prostratum* Nyman – H rept – Paleotemp. (Subcosmop.) – Salerni *et al.*, 2007; 2011 as *Trifolium repens* L. subsp. *prostratum* (Biasoletto) Nyman

♦ *Vicia bithynica* (L.) L. – T scap – Eurimedit. – Salerni *et al.*, 2011

? *Vicia cracca* L. – H scap – Eurasiat. (Circumbor.) – Salerni *et al.*, 2011

Note: This species is very rare, usually confused with the more common *V. villosa* Roth subsp. *varia* (Host) Corb.

♦ *Vicia hybrida* L. – T scap – Eurimedit. – Salerni *et al.*, 2011

## Rosaceae

♦ *Malus sylvestris* (L.) Mill. – P scap – Central Europe Caucas. – Salerni *et al.*, 2011 as *Malus sylvestris* Miller

♦ *Prunus dulcis* (Miller) D.A.Webb – P scap – S-Medit. – Salerni *et al.*, 2007; 2011

♦ *Pyrus spinosa* Forssk. – P caesp – Stenomedit. – Salerni *et al.*, 2007; 2011 as *Pyrus amygdaliformis* Vill.

♦ *Rosa gallica* L. – NP – Central Europe Pont. – Salerni *et al.*, 2011

♦ *Rosa pouzinii* Tratt. – NP – W-Medit. Mont. – Salerni *et al.*, 2011

♦ *Rosa sempervirens* L. – NP – Steno Medit. – Salerni *et al.*, 2007; 2011

♦ *Rosa squarrosa* (A.Rau) Boreau – NP – Eurasiat. – Salerni *et al.*, 2011

Note: This species is no longer recognised as independent from *Rosa canina* L.

♦ *Rubus canescens* DC. – NP – N-Medit. (W-Medit.) – Salerni *et al.*, 2007; 2011

♦ *Sorbus domestica* L. – P scap – Eurimedit. – Salerni *et al.*, 2007; 2011

## Fagaceae

♦ *Castanea sativa* Mill. – P scap – SE-Europ. – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007

♦ *Quercus petraea* (Matt.) Liebl. subsp. *petraea* – P scap – Europ. (Subatl.) – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007

## Betulaceae

♦ *Alnus glutinosa* (L.) Gaertn. – P scap – Paleotemp. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007

## Euphorbiaceae

♦ *Euphorbia amygdaloides* L. – Ch suffr – Central Europe Caucas. – Frassinetti & Bottacci, 1997

## Salicaceae

♦ *Populus tremula* L. – P scap – Eurosib. – Frassinetti & Bottacci, 1997

♦ *Salix cinerea* L. – P caesp – Paleotemp. – Salerni *et al.*, 2011

♦ *Salix eleagnos* Scop. – P caesp – Orof. S-Europ. – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007

## Linaceae

♦ *Linum trigynum* L. – T scap – Eurimedit. – Salerni *et al.*, 2007; 2011

## Geraniaceae

♦ *Geranium dissectum* L. – T scap – Eurasiat. (Subcosmop.) – Salerni *et al.*, 2011

♦ *Geranium purpureum* Vill. – T scap – Eurimedit. – Salerni *et al.*, 2011

♦ *Geranium sanguineum* L. – H scap – Europ. Caucas. – Salerni *et al.*, 2011

## Onagraceae

♦ *Epilobium tetragonum* L. subsp. *tetragonum* – H scap – Paleotemp. – Salerni *et al.*, 2011 as *Epilobium tetragonum* L.



## Sapindaceae

- ♦ *Acer monspessulanum* L. subsp. *monspessulanum* – P scap – Eurimedit. – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007 – Salerni *et al.*, 2011

## Malvaceae

- ♦ *Malva alcea* L. – H scap – Central Europe – Salerni *et al.*, 2011

## Brassicaceae

- ♦ *Cardamine bulbifera* (L.) Crantz – G rhiz – Pontic Central Europe – Frassinetti & Bottacci, 1997  
♦ *Sinapis arvensis* L. subsp. *arvensis* – T scap – Stenomedit. – Salerni *et al.*, 2011 as *Sinapis arvensis* L.

## Caryophyllaceae

- ♦ *Cerastium sylvaticum* Waldst. & Kit. – H scap – Central Europe – Salerni *et al.*, 2011  
♦ *Silene italica* (L.) Pers. subsp. *italica* – H ros – Eurimedit. – Salerni *et al.*, 2011 as *Silene italica* (L.) Pers.  
♦ *Silene vulgaris* (Moench) Garcke – H scap – Paleotemp. (Subcosmop.) – Salerni *et al.*, 2007; 2011

## Primulaceae

- ♦ *Lysimachia punctata* L. – H scap – SE-Europ. Pont. – Salerni *et al.*, 2011

## Rubiaceae

- ♦ *Cruciata laevipes* Opiz – H scap – Eurasiat. – Salerni *et al.*, 2007; 2011  
♦ *Galium rotundifolium* L. subsp. *rotundifolium* – H scap – Orofil. W-Asiat. – Salerni *et al.*, 2011 as *Galium rotundifolium* L.  
♦ *Rubia peregrina* L. – P lian – Stenomedit. Macarones. – Frassinetti & Bottacci, 1997 – Salerni *et al.*, 2007; 2011

## Boraginaceae

- ? *Pulmonaria officinalis* L. subsp. *officinalis* – H scap – Europ. – Frassinetti & Bottacci, 1997  
Note: Most likely a misidentification of *P. hirta* L. by Frassinetti & Bottacci (1997).

## Plantaginaceae

- ? *Plantago holosteum* Scop. – H ros – SE-Europ. (Subpont.) – Salerni *et al.*, 2011  
Note: This species occurs in Southern Tuscany only on serpentine outcrops. Likely it is a mis-identification due to confusion with *P. maritima* L.

## Scrophulariaceae

- ? *Verbascum nigrum* L. – H scap – Europ. S-Sib. – Salerni *et al.*, 2011  
Note: This species is very rare in Southern Tuscany, and this record should be probably referred to *V. chaixii* Vill. subsp. *chaixii*.

## Lamiaceae

- ? *Glechoma hederacea* L. – H rept – Circumbor. – Frassinetti & Bottacci, 1997  
Note: This species is usually confused with *Glechoma hirsuta* Waldst. & Kit., which is the only species occurring in Southern Tuscany.  
♦ *Mentha arvensis* L. – H scap – Circumbor. – Salerni *et al.*, 2011  
? *Salvia haematodes* L. – H scap – Endemic – Salerni *et al.*, 2011 as *Salvia pratensis* L. subsp. *haematodes* (L.) Briq.  
Note: This species does not occur in Tuscany. This record should be probably referred to *Salvia pratensis* L. subsp. *pratensis*. No specimens occur in SIENA for confirmation.  
♦ *Salvia virgata* Jacq. – H scap – SE Europ. (Subpont.) – Frignani & Geri, 2007  
Note: Frignani & Geri (2007) wrote: “This record in the Reserve (Pietraporciana) is the second for the Siena province”. The first was recorded by Mariotti *et al.* (1986). Mariotti’s voucher is kept in SIENA, whereas there is no Frignani & Geri’s specimen.  
♦ *Scutellaria columnae* All. subsp. *columnae* – H scap – NE-Medit. Mont. – Frassinetti & Bottacci, 1997  
? *Teucrium polium* L. – Ch suffr – Stenomedit. – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007 – Salerni *et al.*, 2011 as *Teucrium polium* L.  
Note: This record should be referred to *Teucrium capitatum* L. subsp. *capitatum*.

## Orobanchaceae

- ♦ *Lathraea squamaria* L. – G par – Eurasiat. – Frassinetti & Bottacci, 1997  
♦ *Rhinanthus minor* L. – T scap – Circumbor. Euro-Amer. (Anfiatlant.) – Salerni *et al.*, 2011

## Asteraceae

- ? *Achillea millefolium* L. subsp. *millefolium* – H scap – Eurosib. – Salerni *et al.*, 2007; 2011  
Note: This record is most likely to be *Achillea collina* Becker ex Rchb.  
♦ *Artemisia vulgaris* L. – H scap – Circumbor. – Salerni *et al.*, 2011  
♦ *Carlina vulgaris* L. – H scap – Eurosib. – Salerni *et al.*, 2007; 2011  
♦ *Carthamus lanatus* L. subsp. *lanatus* – T scap – Eurimedit. – Salerni *et al.*, 2011  
? *Centaurea jacea* L. – H scap – Eurasiat. – Salerni *et al.*, 2007; 2011  
Note: This record is most likely to be *Centaurea jacea* L. subsp. *gaudini* (Boiss. & Reut.) Greml.  
♦ *Centaurea solstitialis* L. subsp. *solstitialis* – H bienn – Stenomedit. (Subcosmop.) – De Dominicis *et al.*, 1996 – Frignani & Geri, 2007  
? *Cirsium eriophorum* (L.) Scop. subsp. *eriophorum* – H bienn – Central S-Europ. – Salerni *et al.*, 2011 as *Cirsium eriophorum* (L.) Scop.

Note: This record is most likely to be *Cirsium tenoreanum* Petr.

♦ *Coleostephus myconis* (L.) Cass. ex Rchb.f. – T scap – Stenomedit. – Salerni *et al.*, 2011

♦ *Crepis sancta* (L.) Babc. subsp. *nemausensis* (P.Fourn.) Babc. – T scap – Turanic (Eurimedit.) – Salerni *et al.*, 2011

♦ *Erigeron canadensis* L. – T scap – Cosmopol. – Salerni *et al.*, 2011 as *Conyza canadensis* (L.) Cronq.

? *Inula helenium* L. – H scap – Orofil. SE-Europ. – Salerni *et al.*, 2007; 2011

Note: It is considered unlikely that this species occurs in Tuscany. This record is probably the result of a mis-identification in the field. No voucher specimens occur in SIENA to confirm the species.

♦ *Inula salicina* L. – H scap – Europ. Caucas. – Salerni *et al.*, 2007; 2011

♦ *Lactuca serriola* L. – H bienn – Eurimedit. S-Sib. – Salerni *et al.*, 2011

♦ *Tanacetum corymbosum* (L.) Sch.Bip. subsp. *achilleae* (L.) Greuter – H scap – Eurimedit. – Salerni *et al.*, 2007; 2011

♦ *Taraxacum* sect. *Erythrosperma* Dahlst. – H ros – Pa-leotemp. – Salerni *et al.*, 2011 as *T. laevigatum* (Willd.) DC.

#### Adoxaceae

♦ *Sambucus nigra* L. – P caesp – Europ. Caucas. – De Dominicis *et al.*, 1996 – Frassinetti & Bottacci, 1997 – Frignani & Geri, 2007 – Sabbatini *et al.*, 2011

#### Caprifoliaceae

? *Knautia purpurea* (Vill.) Borbás – H scap – W-Medit. Mont. – Salerni *et al.*, 2011

Note: This record is most likely to be *Knautia arvensis* (L.) Coult.

♦ *Scabiosa columbaria* L. – H scap – Eurasiat. – De Dominicis *et al.*, 1996 as *Scabiosa* gr. *columbaria* – Salerni *et al.*, 2007; 2011 – Frignani & Geri, 2007 as *Scabiosa gramuntia* L.

#### Apiaceae

♦ *Tordylium apulum* L. – T scap – Stenomedit. – Salerni *et al.*, 2011

#### CONCLUDING REMARKS

The above floristic lists include 372 taxa resulting from field surveys and 123 taxa resulting from a literature review. The lists include 11 cultivated and 2 invasive alien species. Finally, 17 taxa, reported in the published literature, are considered unlikely to be present, from the available information on distribution and occurrence data, and are likely to have been misidentifications in the field. Our contribution to the flora of Pietraporciana Nature Reserve, includes therefore taxa distributed

in 281 genera and 69 families. The most well represented families are: Asteraceae (61 taxa), Fabaceae (60), Poaceae (40), Rosaceae (29), Lamiaceae (25) and Orchidaceae (23). Fabaceae and Poaceae are more abundant in the meadows and open habitats of the Reserve, and it is worth noting that the isolated small grassland areas host many species of Orchidaceae. The relatively high representation of woody families (7 taxa belong to Pinaceae, 6 to Salicaceae, 5 to Betulaceae, 5 to Fagaceae and 3 to Cupressaceae) is due to the wide forest cover of Reserve, enriched by stands of planted species (Tab. 1). The Pietraporciana Nature Reserve hosts a relatively high number of hemicryptophytes in association with the extensive herbaceous communities. The geophytes are also well-represented due to the maturity of the forests (Raffaelli & Rizzotto, 1991; Angiolini *et al.*, 1999; Paci, 2013). A relatively high number of phanerophytes as well as low proportions of chamaephytes, confirm the outstanding value of the forest in the Reserve (Selvi, 1996). Eurasiatic elements are relatively prominent when compared to Mediterranean s.l. and Eurimediterranean taxa dominate. The amount of Boreal entities is comparable to other areas from Apennines and Tyrrhenian coast (Mazzeschi & Selvi, 1999; Frignani *et al.*, 2004; 2008). It is of particular interest to note the presence of orophilous species as *Galium rotundifolium* subsp. *rotundifolium*, *Narcissus poeticus*, *Saxifraga rotundifolia* subsp. *rotundifolia*, *Tragopogon samaritani*, some of which, are shared with Monte Amiata and Monte Cetona (Selvi 1996; Mazzeschi & Selvi, 1999).

In particular, we report the presence of 4 relevant species: i) *Crataegus ×media*, hybrid between *C. monogyna* and *C. laevigata*, which is the first record of this nothospecies in Tuscany (Fig. 2); ii) *Teucrium siculum* subsp. *siculum*, which grows in acidophilous mesic forest with *Quercus cerris* and represents another interesting species, previously recorded only once in Siena province as the species is at northern limit of its distribution (Scoppola & Bascietto, 2002; Fig. 3); iii) *Avena sterilis* subsp. *ludoviciana*, here reported for the second time in Tuscany after Arrigoni (2003); iv) *Centaurea arrigonii*, never recorded in Southern Tuscany.

Despite Pietraporciana Nature Reserve being established for the conservation value of the presence of relict beech forest, not all the 36 protected taxa (Tab. 2) occur in this habitat. It is probable that the beneficial effects of the Reserve establishment contributed to the protection of a range of species associated with habitats present in the Reserve other than beech forest. The conservation value of the Reserve is enhanced by 11 species that are Italian endemics (Tab. 1) and 4 sub-endemics. A species record that is worthy of mention is *Erysimum maremmanum* a narrow endemic to Tuscany. The percentage of endemic species is higher in the Reserve when compared to other similar areas (Frignani *et al.*, 2004; 2008). Excluding planted spe-



Fig. 2. *Crataegus xmedia* Bechst. new record for Tuscany. Specimen preserved in UTV (n. 33936).



Fig. 3. *Teucrium siculum* (Raf.) Guss.: flower detail (A) and inflorescence (B).

cies, the natural value of Pietraporciana is highlighted also by the presence of only two alien species (*Artemisia verlotiorum* and *Robinia pseudoacacia*). From a conservation point of view 36 taxa resulted interesting (Tab. 2): 24 are afforded protection in Regional Law 56/2000, 3 are listed in the Regional Red Lists plants of Italy (Conti *et al.*, 1997), 2 are listed under the Naturalistic Tuscan Repertoire (Sposimo & Castelli, 2005;

Viciani *et al.*, 2014), 1 species is listed in the Atlas of species at extinction risk (Scoppola & Spampinato, 2005) and 3 species are listed in the Red List for the Italian Flora (Rossi *et al.*, 2013). The presence of 11 introduced forestry species (*Abies alba*, *A. cephalonica*, *Aesculus hippocastanum*, *Alnus cordata*, *Cedrus atlantica*, *C. deodara*, *Chamaecyparis lawsoniana*, *Pinus nigra* subsp. *nigra*, *P. sylvestris*, *Pseudotsuga menziesii*, *Cupressus sempervirens*), is the result of past afforestation and to long standing forest exploitation in the area.

In conclusion, although not an exhaustive study, the contribution of vascular flora of the Pietraporciana Reserve improved the level of knowledge of this little known part of Southern Tuscany and highlighted the presence of a precious natural environment, hosting rare or phytogeographically important species. The combination of geological and climatic factors, as well as centuries-old presence of human activities, have influenced the development of diverse habitats with a distinct and interesting flora. The mosaic of different communities makes the Pietraporciana Reserve of considerable importance for the conservation of biodiversity and the natural landscape of Southern Tuscany. Pietraporciana Nature Reserve hosts a well-represented Steno-mediterranean plant diversity from those associated with grassland, to Boreal and orophilous species, mainly in beech forest.

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Tab. 1. Taxonomic families with number of species per family and percentage found in Pietraporciana Nature Reserve (only families with more than 5 species are shown).

Family	n° species	%
Asteraceae	61	12.3
Fabaceae	60	12.1
Poaceae	40	8.00
Rosaceae	29	5.85
Lamiaceae	25	5.05
Orchidaceae	23	4.64
Caryophyllaceae	16	3.51
Ranunculaceae	14	3.23
Apiaceae	12	2.42
Asparagaceae	11	2.22
Brassicaceae	10	2.02
Geraniaceae	10	2.02
Rubiaceae	10	2.02
Plantaginaceae	9	1.81
Caprifoliaceae	8	1.61
Cyperaceae	7	1.41
Pinaceae	7	1.41
Salicaceae	6	1.21



Tab. 2. Species of conservation interest in the Reserve (Conti *et al.*, 1997: A; L.R. 56/2000, attachment A: B; Re.Na.To.: C; Scoppola & Spampinato 2005: D; Rossi *et al.*, 2013: E) and endemic species (Peruzzi *et al.*, 2014: F). LR = Low Risk; LC = Least concern.

	A	B	C	D	E	F
<i>Achillea ageratum</i>	-	X	-	-	-	-
<i>Allium pendulinum</i>	-	X	-	-	-	-
<i>Anemone apennina</i> subsp. <i>apennina</i>	-	X	-	-	-	-
<i>Asparagus acutifolius</i>	-	X	-	-	-	-
<i>Asparagus tenuifolius</i>	-	X	-	-	-	-
<i>Atropa bella-donna</i>	-	X	-	-	-	-
<i>Centaurea arrigonii</i>	-	X	X	-	-	X
<i>Cirsium tenoreanum</i>	-	-	-	-	-	X
<i>Consolida regalis</i> subsp. <i>regalis</i>	-	X	-	-	-	-
<i>Dactylorhiza romana</i> subsp. <i>romana</i>	-	X	-	-	-	-
<i>Dactylorhiza insularis</i>	LR	X	X	-	-	-
<i>Digitalis micrantha</i>	-	X	-	-	-	X
<i>Echinops sicularis</i>	-	-	-	-	-	X
<i>Erodium acaule</i>	-	X	-	-	-	-
<i>Erysimum maremmanum</i>	-	-	-	-	-	X
<i>Galanthus nivalis</i>	-	X	-	-	LC	-
<i>Globularia bisnagarica</i>	-	X	-	-	-	-
<i>Helleborus viridis</i> subsp. <i>bocconeii</i>	-	X	-	-	-	X
<i>Koeleria splendens</i>	-	-	-	-	-	X
<i>Lathraea squamaria</i>	-	X	-	-	-	-
<i>Lilium bulbiferum</i> subsp. <i>croceum</i>	-	X	-	-	-	-
<i>Lilium martagon</i>	LR	X	-	-	-	-
<i>Listera ovata</i>	-	X	-	-	-	-
<i>Lysimachia punctata</i>	-	X	-	-	-	-
<i>Loranthus europaeus</i>	-	X	-	-	-	-
<i>Narcissus poeticus</i>	-	X	-	-	-	-
<i>Orchis provincialis</i>	-	-	-	-	LC	-
<i>Ornithogalum etruscum</i> subsp. <i>etruscum</i>	LR	-	-	X	-	X
<i>Plantago maritima</i>	-	X	-	-	-	-
<i>Platanthera chlorantha</i>	-	X	-	-	-	-
<i>Polygala flavescens</i>	-	X	-	-	-	X
<i>Pulmonaria hirta</i>	-	X	-	-	-	-
<i>Ranunculus garganicus</i>	-	X	-	-	-	-
<i>Ruscus aculeatus</i>	-	-	-	-	LC	-
<i>Salix apennina</i>	-	X	-	-	-	-
<i>Salvia pratensis</i> subsp. <i>pratensis</i>	-	X	-	-	-	-
<i>Salvia virgata</i>	-	X	-	-	-	-
<i>Scabiosa uniseta</i>	-	X	-	-	-	X
<i>Scilla bifolia</i>	-	X	-	-	-	-
<i>Tilia cordata</i>	-	X	-	-	-	-
<i>Vicia ochroleuca</i> subsp. <i>ochroleuca</i>	-	-	-	-	-	X

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